Virus Name: Dengue 2	Abbreviation: DENV

Status
Arbovirus

Select Agent
No

SALS Level
2

SALS Basis
Results of SALS surveys and information from the Catalogue.

Other Information
DOC Permit Required

Antigenic Group
B

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
New Guinea C

Accession Number

Original Date Submitted
2/26/1985

Family
Flaviviridae

Genus
Flavivirus

Information From
W. McD. Hammon

Address
Grad. Sch. Public Health, Univ. of Pittsburgh, Pittsburgh, PA 15213 USA

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
A.B. Sabin (1,2)

Isolated at Institute
Cincinnati, Ohio

Host Genus
Man

Species

Host Age/Stage
Adult

Sex
Male

Isolated From	Isolation Details
Serum/Plasma	

Signs and Symptoms of Illness
Six day fever and malaise without rash occurring during epidemic recognized clinically as dengue

Arthropod

Time Held Alive before Inoculation

Collection Method
Blood taken 24 hours after onset of fever

Collection Date
4/30/1944

Place Collected (Minimum of City, State, Country)
New Guinea, sent by Cornelius B. Philip

Latitude
5° S

Longitude
140° E

Macrohabitat

Microhabitat

Method of Storage until Inoculated
Water ice 4/30/44 to 5/21/44; dry ice 5/21/44 to 6/12/44

Footnotes

Section III - Method of Isolation

Inoculation Date
6/12/1944

Animal (Details will be in Section 6)
Man*

Route Inoculated
Intracutaneous + iv

Reisolation
No

Other Reasons
Classical dengue with rash after appropriate incubation in first and subsequent volunteers and Ae aegypti transmission.**

Homologous Antibody Formation by Source Animal
Not tested

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical
RNA, Single Strand

Pieces (number of genome segments)	Infectivity	Sedimentation Coefficients(s) (S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number	Details **Buoyant density in CsCl 1.22 gm/cm3 (3). For other detailed studies on nature and physical properties, see References 4,5,**	
Non-virion Polypeptides: Number	Details	
Virion Density	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test)	After Treatment Titer **<2.0 dex**	Control Titer **5.1 dex (6)**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **<2.0 dex**	Control Titer **6.4 dex (7)**

Other (formalin, radiation)
Sens. to trypsin, chymotrypsin, papain, pancreatic lipase, sodium lauryl sulfate

Virion Morphology

Shape **Spherical particles**	Dimensions **48-50 nm; 50-55 nm (20)**
Mean nm	Range nm
Measurement Method	Surface Projections/Envelope

Nucleocapsid Dimensions,

EM; negative staining (3); thin-section (20)	**Spiked virions (20); spherical 7 mm capsomere-like**	Symmetry **Cores = 20-22 nm diameter (20)**

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation
Inclusion Bodies	Other	

Hemagglutination

Hemaggiutination **Yes**	Antigen Source **SMB ext. by borate-KCl, pH 9; acetone-ether, sucrose-acetone**	Erythrocytes (species used) **Goose**
pH Range **6.0-6.8**	pH Optimum **6.4**	
Temperature Range **4dC, 24dC, 37dC**	Temperature Optimum **24dC, 37dC**	

Remarks
After exp. human passage, virus adapted to nb mice by ic inoc. (8). 3 HA fractions and at least 3 CF's demonstrated and studied (3-5, 9-11). * Human volunteer ** Other similar agents isolated from same epidemic (1).

Serologic Methods Recommended
HI, CF, PRNT, immunodiffusion

Footnotes
After exp. human passage, virus adapted to nb mice by ic inoc. (8). 3 HA fractions and at least 3 CF's demonstrated and studied (3-5, 9-11). * Human volunteer ** Other similar agents isolated from same epidemic (1).

Section V - Antigenic Relationship and Lack of Relationship to Other Viruses

DEN-2 virus is antigenically closely related to other types of DEN viruses. Currently, the dengue viruses are considered to be related more closely to each other than to other flaviviruses. The dengue viruses comprise a separate complex in serogroup B ([27] , [28]). (See first two paragraphs for DEN-1, Section 5, for more detail regarding common antigens and strain variation.) TH-36, previously listed as in the Catalogue (No. 262) was suggested as a possible type 5 since it was isolated from one of the early Thai hemorrhagic fever cases in Bangkok in 1958 ([12] - [14]) and was found eventually to differ antigenically to a significant degree from type 2 New Guinea C prototype. Differences have been shown by CF ([13] , [14]), immunodiffusion [15] and immuno- electrophoresis [16] but not by soluble CF (SCF) antigen [17] . It is generally accepted that strain differences among DEN viruses may be rather prominent. Their significance is as yet unknown.

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M)(LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice; inoculation of mosquitoes; LLC-MK2 and mosquito cell cultures

Cell system (a)	Virus passage history (b)	Evidence of Infection							
		CPE			PLAQUES			Growth Without CPE	
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	+/- (g)	

Cell culture: see DEN-1 registration card

Section VII - Natural Host Range (Additional text can be added below table)

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Man: Very large number of isolations from acute phase blood, days 1-5. Principal source of mosquito infection	Many		SE Asia, India, NewGuinea, Philippine Is., Nigeria, West Indies, Trinidad, Tahiti (22)
Man		Many	Previously, not presently: Florida, Texas, Louisiana, Panama, Greece, Guam, Australia. Currently: Indonesia, Venezuela
Monkeys	1		Malaysia (19)
Monkeys		Many	Malaysia, Philippine Is, and other SE Asian areas
Sentinel monkey (blood)	2		Malaysia (23)
Mosquitoes:	Many		SE Asia, India
Aedes aegypti	1		Singapore (18)
Aedes albopictus			
Ae. aegypti (pools)	9/27		Colombia (24)
Aedes niveus and Anopheles (cel) balabacensis introlatus most likely jungle canopy vectors for dengue in Gunong Besout Forest, Malaysia (29).			

Section VIII - Susceptibility to Experimental Infection (include viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log10/ml
Mice (nb)	High pass. MB	ic 0.01	Paralysis and death	4	7.4
Mice (nb)		ip 0.03	Usually none		
Mice (nb)		sc			
Mice (wn)		ic 0.03	Paralysis and death	4-5	7.0
Mice (wn)		ip 0.1	None		
hamster (nb)		ic	Death		4.0
hamster (3-4 wk)		ic	Occasional illness or death		
hamster (3-4 wk)		ip	None		
rabbit (yg)		ic,sc,iv	None		
guinea pig (yg)		ic	None		
embryonated egg		various	None		
monkey		ic	Encephalitis, death		
monkey	Low pass. MB	ic	Viremia, NT antibody		
monkey		sc,,intracut	Viremia, NT antibody		
monkey		sc,,intracut	Viremia, NT antibody		
man		sc,,intracut	Dengue fever		

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log10/ml (b)		Incubation period (c)		Transmision by bite (d)		Assay of arthropod, log10/ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System
Aedes aegypti, Ae albopictus, Ae scutellaris complex: Experimental transmission successful following feeding on mouse brain virus or viremic animal									
Natural occurrence of transovarial transmission demonstrated in Aedes aegypti(30).									

Section X - Histopathology

Character of lesions (specify host)
In man: See DEN 1 registration card. In mouse: See Reference 21.

Inclusion Bodies
Man

Intranuclear

Organs/Tissues Affected
Lungs (M), liver (M), heart (M), blood vessels (M), marrow (M); all the above for SE Asian hemorrhagic fever only. See texts dengue fever.

Category of tropism
Vascular without necrosis or inflammation

Section XI - Human Disease

In Nature
Significant

Residual

Death
Significant

Subclinical
Reported

Overt Disease
Reported

Clinical Manifestations
Fever, headache, prostration, stiff neck, myalgia, arthralgia, CNS signs, (including encephalitis), hemorrhagic signs, respiratory involvement, leukopenia, CNS pleocytosis, rash, lymphadenopathy, jaundice, vomiting, melena, hematemesis, hemoptysis, etc. (SE Asian hem. fever only)

Number of Cases
Probably millions but type specificity seldom dete

Category (i.e. febrile illness, etc.)
Febrile illness with rash, hemorrhagic fever

Section XII - Geographic Distribution

Known (Virus detected)
Caribbean basin; Mexico, Venezuela, Colombia, Senegal, Kenya, Nigeria, India, Bengladesh, SE Asia, including Philippines, various Pacific island groups, Australia

Suspected (Antibody only detected)

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Remarks

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